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In the Description:

Substitute the following description for the original description–

TECHNICAL FIELD

[0001] This invention relates to systems of identifying remote objects by detection of gamma, X-ray and neutron radiations, in particular, to systems that allow the identification of objects that are concealed or forbidden to transport, for example, at customs, border check-points , and the like.

BACKGROUND ART

[0002] CZT detectors have been known from "X-Ray and Gamma Ray Detector High Resolution CZT Cadmium Zinc Telluride", web pages, amptek.com, Apr. 11, 2001, 8 pages and "Charge Trapping in XR-100T-CZT Detectors Application Note", web pages, amptek.com, Apr. 18, 2001, 15 pages. A hand-held radiation detector, (CZT spectrometer) designed by Loc-Alamos National Lab. uses a Cadmium-Zink-Tellurium (CZT) semiconductor detector that is capable of identifying gamma and neutron radiation of radioactive materials. In real time the detector produces precise data for the portable device, insensitive to a temperature variation of the environment. The detector includes a CZT chip installed in a housing with a charge-sensitive amplifier and an input-output unit for spectrum analyzing, as well as a multichannel analyzer with a microcontroller. In this device, a specialized software is used that links to a built-in microcontroller and monitoring operations in CZT spectrometer.

[0003] A disadvantage of this device is the placement of a gamma and X-rays detector in one housing with a hand computer, which does not allow keeping several sensing devices under the control.

[0004] U.S. Patent 6,668,277 describes a multi-channel analyzer designed to conveniently gather, process, and distribute spectrographic pulse data. The multi-channel analyzer may operate on a computer system having memory, a processor, and the capability to connect to a network and to receive digitized spectrographic pulses. The multi-channel analyzer may have a software module integrated with a general-purpose operating system that may receive digitized spectrographic pulses for at least 10,000 pulses per second. The multi-channel analyzer may further have a user-level software module that may receive user-specified controls dictating the operation of the multi-channel analyzer, making the multi-channel analyzer customizable by the end-user. The user-level software may further categorize and conveniently distribute spectrographic pulse data employing non-proprietary, standard communication protocols and formats

[0005] The analog imperfection is a limitation of the functional capabilities of the final device that includes only reception, signal coding from the sensor and its transmission through a multichannel communication line, including Internet signal, corresponding to received signal spectrum.

[0006] Also known from U.S. Patent 4,550,381 is a hand-holdable, battery-operated, microprocessor-based spectrometer gun that includes a low-power matrix display and sufficient memory to permit both real-time observation and extended analysis of detected radiation pulses. Universality of the incorporated signal processing circuitry permits operation with various detectors having differing pulse detection and sensitivity parameters.

[0007] Utility Model, Russian Federation No 31001, shows as a prototype, a system for

a remote radiation control and objects identification containing a stationary detection system of fissionable and nuclear materials, connected with a relevant information monochannel with a personal computer having a display device, information and signalling recording system, with the capability of an information transfer by means of information channels, which is supplied with the videosystem device, connected with video images synchronization device and to fissionable and nuclear materials readings recorder (with a timer).

[0008] The imperfection of the known system is in its stationary state--only the objects passing through a window of the fixed system can be checked, and it is impossible for an authorized person to leave a place of observation, thereby leaving the system without control. Moreover the system selected as the prototype, is closed and does not permit the to use of additional resources, and also to work simultaneously with different types of detectors.

BRIEF DESCRIPTION OF THE INVENTION

[0009] The task of the present invention is to create a mobile and simultaneously high-capacity object detection and identification system according to its gamma, X-ray and/or neutron radiation. Moreover, invention task is to make it possible to develop a distributed multilevel system, for departmental usage, and an open system for common usage.

[0010] Briefly, the invention provides a device to detect gamma, X-ray and neutron radiations from an object that includes a detection unit and a preprocessing unit. The detection unit is created separately with a micro controller and a data transfer device. The preprocessing unit is created with a display, microprocessor, input unit, a

connecting unit for communicating with an expert system, a channel for data acquisition from the detection unit, and a spectrums analysis unit.

[0011] The connecting unit for communicating with the expert system of objects identification is equipped additionally with a channel for bilateral (i.e. two-way) transfer of audio and video information.

[0012] A portable computer with connected radiotelephone or other mobile information reception and transfer device, for example, smart phone, or portable computer, is used as preprocessing device.

[0013] The preprocessing unit is supplied additionally with a video information input unit, for example, with a video camera.

[0014] Several detection units can be used, each supplied with an identification marker to interact with the preprocessing unit.

[0015] The detection unit and preprocessing device can be dispose in a common housing and the detection unit may be changeable.

[0016] The system of objects identification by gamma, X-ray and neutron radiation includes a detection unit and an information preprocessing unit of two hierarchic parts, one of which is the expert system, located in a networks, and they are interconnected by a communication link. According to the invention, the expert system is connected by a communication link with a national and/or departmental emergency warning system that is activated in case of emergency situations.

[0017] The expert system may also include a person—expert in the field of objects identification.

[0018] The construction of the device in the form of separate, spaced-apart modules

that are interconnected by a communication link, where the detection unit is realized with a separate micro controller, provides implicit advantages, for example, object identification directly in the place where it is, irrespective of identification place and object complexity. The size of the detection unit with a microcontroller can be small and it can be placed in the given place of control zones. Moreover, the departmental network allows the control of all authorized experts staff operation from one working place. Information processing capabilities in every specific situation rise considerably owing to porting of previously adjusted expert system. It is enough to have one central data file for all preprocessing devices servicing, that allows the making of data renew and actualization for all users simultaneously.

[0019] The invention is illustrated by drawings.

Fig. 1 schematically illustrates a detection system in accordance with the invention;

Fig. 2. schematically illustrates the interaction of the components of the detection system; and

Fig. 3 illustrates a block diagram of a preprocessing unit in accordance with the invention.

[0021] Referring to Fig. 1, the objects registration and identification device includes the detection unit (DU) 1, preprocessing unit (PPU) 2 with a display and input unit, and departmental expert system (DES) 3. The devices are connected in a local network (LN). The expert system can be located in a open network, for example, an open expert system in Internet (OES) 4. The system can contain national or other state or intergovernmental system of emergency warning (NSEW) 5. When the system is used

at a customs terminal, the detection units 1 can be installed in the check points 6, passengers passages 7 and in places of transport thoroughfare 8. The preprocessing unit 2 is located where there is an authorized person (not shown).

Referring to Fig. 3,the preprocessing unit 2 includes display unit D 9 and information input device (ID) 10, which can be realized as keyboard or graphical input (graffiti); processor (P) 11 and interface units (IU) 12. There is specialized software in P, which carries out the following actions:

[0022] Selection performance parameters (search, measurement and accumulation of scintillation spectrums);

[0023] Identification of a connected DU 1 under its identification number;

[0024] Information interchange with DU 1 and information output in D 9;

[0025] Objects identification according to accumulated scintillation spectra;

[0026] Information exchange through IU 12 with exchange interfaces of Blue Tooth or WI-FI with DES usage or through GSM with GPRS and OES usage.

[0027] The device is supplied with a unit of the wireless link 13 with the detection units 1 (for example, IrDA or Blue Tooth) and connection unit 14 (for example, GSM) with DES expert system 3 or OES 4. Preprocessing unit 2 can include a scanner (SC) 15 and information video-audio input unit (VAU) 16.

[0028] The device and system work in the following way.

[0029] The detection unit 1 can be used as an independently operating device supplied with the microprocessor controller and information transfer devices, and also together with PPU device 2 (which can be any of portable devices (Mobile Device)--smart phone, notebook, communicator etc.). DU 1 should be handled by persons monitoring for

[0031] Structurally, the OES or DES are constructed identically, and differ only by arrangement (or in corporate (local) DES network or in OES Internet) and by data and information bases. By request, the user (authorized person) gets instructions from OES or DES, following which a decision on the further actions is made. In the case of non-typical situations, when OES or DES are not able to make a decision, the experts from crisis centers are linked up to the operation, and having analyzed all user actions and theirs results, direct further actions and make a decision on the arisen situation hazard.

[0032] In a DU 1 there is a built-in honker, which can be used independently (without PPU) or can be switched--off at the command of PPU. In this case, the honker will be used for an audio alarm.

[0033] The DU 1 with PPU 2 is located at the persons exercising control of the detection process automation, searching, localization, measuring, initial identification of gamma, X-ray and neutron radiation sources and checking connection with higher hierarchic system.

[0034] In the case of critical situations, for example, when the radiation permissible level is exceeded, or object forbidden to transportation is identified, DES automatically contacts with ENSEW 5. In this case, the authorized persons have duty regulations that provide for immediate localization and an immobilization of the object.

[0035] The additional usage of a scanner, for example, for scanning a bar code, makes it possible for an authorized person to increase input speed of the standardized information indicated by a bar code.

[0036] The opportunity of linking the PPU 2 and DU 1 in one housing allows an authorized person to localize and check objects in any place, where it is difficult to

install the stationary detection units. Owing to that fact, the system mobility is considerably improved. Moreover, the replacement of one detector in the PPU by another, allows readjusting of the device quickly to another radioactive radiation type. Thus, the wire less communication of a DU 1 and PPE 2 allows the replacement of sensors without any wires commutation.

[0037] The use of the Internet for an open expert system arrangement allows considerable savings in the user's material resources during system installation in control zones. In this case, the user purchases only detection units and preprocessing units, and can use computing resources in a common user network. At that, the open expert system can operate on a commercial basis.

[0038] Thus, usage of all characteristics allows a solution to the set problem--to create the mobile and simultaneously powerful enough objects registration and identification system.

[0039] The technical documentation is prepared and the prototype models with smart phone Mitac Mio 8380 are made.

gamma, X-ray and neutron radiation sources (RS), or be installed in the specially assigned places. These inspectors should stay in special control zones (customs and/or frontier zones) or in supposed places of RS occurrence (airports, railway or sea-ports, places of people gathering, control check points of materials, foodstuffs etc.).

[0030] Registration of gamma, X-ray and neutron radiation in the search mode is carried out in zones, in which joint action with additional equipment applied for RS check in these zones is possible: transport, foot-passengers or luggage monitors. Upon determination in an RS control zone, a detection signal is transmitted over transmission channels to the preprocessing unit/units 2, where automatic initial identification of this source with the help of PPU 2 intrinsic computing resources occur. If the user is not able at his own to make a decision about the danger of the arisen situation or there are no PPU computing resources 2, for example, the received spectrum is absent in the CPC database, then the user can contact the higher hierarchic expert system (by local network when working with the departmental expert system DES 3 or by GPRS or IP when working with expert system located in common user network OES 4). In this case, the expert system starts to control the user's actions, sending instructions to him and receiving the results of his actions (measured values, accumulated spectrums, etc.). The obtained data are processed by DES 3 or OES 4 and are returned as user instructions for additional monitoring or RS identification. All user actions are saved in the database and can be inspected by the expert after addressing to him. If there are not enough DES 3 resources, the system connects with the expert in the field of objects identification, which can demand additional actions or information from the user, including information on the RS over video channel.

In the Claims:

1. to 9. (canceled)

10. (new) An object identification system comprising

at least one detection unit for positioning at a check point to detect gamma, X-ray and neutron radiations from an object at said check point and emitting a corresponding detection signal thereto, said detection unit including a microprocessor controller and an information transfer device; and

a preprocessing unit for receiving and analyzing said detection signal to identify the object at said check point, said preprocessing unit including a display unit, an information input device, a processor having a spectrums analysis unit and a connecting unit for communicating with an expert system for receiving instructions therefrom for further processing of the object at said check point.

11. (new) An object identification system as set forth in claim 10 wherein said connecting unit includes a channel for two-way transfer of audio and video information.

12. (new) An object identification system as set forth in claim 10 wherein said preprocesssing unit is a mobile device selected from the group consisting of a smart phone and a notebook.

13.(new) An object identification system as set forth in claim 10 wherein said preprocesssing unit includes a scanner.

14. (new) An object identification system as set forth in claim 10 further comprising a plurality of said detection units disposed at a plurality of check points, each said

detection unit being connected to said preprocesssing unit and including an identification marker.

15. (new) An object identification system as set forth in claim 10 further comprising a common housing containing said detection unit and said preprocesssing unit.

16. (new) An object identification system as set forth in claim 10 wherein said preprocesssing unit is selectively connected to a remote expert system for receiving instructions therefrom for further processing of the object at said check point.

17.(new) An object identification system as set forth in claim 10 wherein said preprocessing unit has a receiver selectively connected to a global positioning system to determine the geographic location of the object at said check point.

18. (new) An object identification system comprising

at least one detection unit for positioning at a check point to detect gamma, X-ray and neutron radiations from an object at said check point and emitting a corresponding detection signal thereto, said detection unit including a microprocessor controller and an information transfer device;

a preprocessing unit for receiving and analyzing said detection signal to identify the object at said check point, said preprocessing unit including a display unit, an information input device, a processor having a spectrums analysis unit and a connecting unit for communicating with an expert system for receiving instructions therefrom for further processing of the object at said check point; and

an expert system remote from said detection unit for receiving instructions from said preprocessing unit for further processing of the object at said check point and having a communication channel connected to one of a national emergency warning system and a departmental emergency warning system for activation in response to an emergency situation.

19.(new) An object identification system as set forth in claim 18 wherein said preprocessing unit has a receiver selectively connected to a global positioning system to determine the geographic location of the object at said check point.